REMARKS

Upon entry of the instant amendment, claims 1-5 and 8-11 are pending. Claims 1, 3 and 5 have been amended to overcome the rejection under 35 U.S.C. §112. Claim 10 has been amended to correct the form. Claims 6 and 7 have been cancelled. It is respectfully submitted that upon entry of the instant amendment the application is in condition for allowance.

CLAIM OBJECTIONS:

Claim 7 has been objected to under 37 CFR 1.75(c), as being an improper dependent claim for failing to further limit the subject matter of the previous claim. Claim 7 as well as claim 6 have been cancelled. Thus this objection should be obviated.

CLAIM REJECTIONS - 35 U.S.C. §112:

Claims 1 to 5 have been rejected under 35 U.S.C. §112, second paragraph for being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention. Claims 1, 3 and 5 have been amended to eliminate the n+ doped AlGaN layer. Accordingly, this rejection should be obviated.

CLAIM REJECTIONS - 35 U.S.C. §103:

Claims 1 and 6-9 have been rejected under 35 U.S.C. §103 as being unpatentable over *Song* U.S. Patent No. 6,410,944 in view of *Chow* U.S. Patent No. 6,320,212. The Examiner is respectfully requested to reconsider and withdraw the rejection based on the remarks below.

The invention relates to a heterojunction bipolar transistor (HBT) based upon a GaN/AlGaN material system. It is respectfully submitted that neither the *Song* or *Chow* references disclose such a material system. More particularly, the *Song* reference discloses a GaN/AlGaAs material system. As such, it is clear that the *Song* patent does not disclose a AlGaN/GaN superlattice for the base. The *Chow* patent relates to a GaSb/InAs/AlSb material

system. It is respectfully submitted that the teachings of the *Chow* patent which relate to a different material system are not applicable to the material system recited in the claims at issue. At the very least, the difference in material systems suggest that the two references teach away from combination with each other. If anything, the *Chow* patent suggests a base formed from GaSb - totally different from the material recited for the base in the claims at issue. While the *Chow* patent discloses a superlattice base, the superlattice is for a totally different material system GaSb/AlGaSb. Since the properties of material systems are drastically different, it is respectfully submitted that the teachings of *Chow* are not combinable with the teachings of *Song*. Thus, the Examiner is respectfully requested to reconsider and withdraw the rejection of claims 1 and 6-9.

Claim 5 and claims 1 and 6-9 have been rejected under 35 U.S.C. §103(a) as being unpatentable over the *Song* and *Chow* references and further in view of *Razeghi* U.S. Patent No. 5,831,277. The Applicant respectfully disagrees that *Chow* provides a motivation for employing a AlGaN/GaN superlattice in the base region of the *Song* HBT. First of all, as mentioned above, although the *Chow* patent discloses a superlattice in the base region, it does not disclose a superlattice formed from AlGaN/GaN. The base superlattice disclosed in the *Chow* system is a completely different material system and is formed from GaSb/AlGaSb. Although *Razeghi* discloses a AlGaN/GaN superlattice, it does not disclose the use of a superlattice disposed between AlGaN emitter and a GaN collector. Rather, *Razeghi* discloses disposing the superlattice between GaN layers different than the structure recited in the claims at issue. For these reasons and the above reasons, the Examiner is respectfully requested to reconsider and withdraw the rejection of claim 5.

Claims 2, 3, 4, 10 and 11 have been rejected under 35 U.S.C. §103 as being unpatentable over the *Song*, *Chow* references or alternatively in view of the *Song*, *Chow* and *Razeghi* patents further in view of *Ohta* U.S. Patent No. 4,620,206. The *Song*, *Chow* and *Razeghi* patents have been discussed above. The *Ohta* patent likewise does not disclose a structure as recited in the claims at issue. This patent was cited for merely teaching that barrier-grading can be employed in superlattices.

It is respectfully submitted that all of the rejections under 35 U.S.C. §103(a) involve a combination of multiple references. It is respectfully submitted that the Examiner has failed to make a *prima facie* case for obviousness in any of the rejections by failing to show that the combination of the references was suggested. Quite the contrary. In particular, except for the *Song* reference which admittedly does not disclose the structure recited in the claims at issue, the other references of record relate generally to different material systems. It is respectfully submitted that the rejections are based on impermissible hindsight and is based upon picking and choosing among the various references using the claims as a blueprint which is clearly impermissible.

For these reasons, the Examiner is respectfully requested to reconsider and withdraw this rejection. Please continue to forward all correspondence on this matter to TRW.

CONCLUSION

In view of the foregoing remarks, Applicant respectfully requests reconsideration of this application and that the application be passed to issue.

Respectfully submitted,

Date: 12-30-02

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ATTACHMENT FOR SPECIFICATION AMENDMENTS
VERSION WITH MARKINGS TO SHOW CHANGES MADE
U.S. Serial No. 09/833,372; Filed April 12, 2001

Paragraph **[0005]** on page 2, was amended as follows:

[0005] In a homojunction bipolar transistor, holes are ejected [into] from the emitter layer into the base layer as a result of the forward biased emitter junction. The injection of holes into the base layer results in a lower cut off frequency and lower current gain of the device resulting in lower efficiency and a lower frequency of operation of the device. In order to reduce the hole injection, the base p-doping is normally made lower than the emitter. Unfortunately, such a configuration results in a base layer with more resistance which, in turn, reduces the output power of the device.

ATTACHMENT FOR CLAIM AMENDMENTS
VERSION WITH MARKINGS TO SHOW CHANGES MADE
U.S. Serial No. 09/833,372; Filed April 12, 2001

1. (Amended) A heterojunction bipolar transistor (HBT) comprising:

a substrate;

an n+ doped GaN subcollector layer;

an n- doped GaN collector layer;

a p+ doped base layer formed on top of said collector layer defining a base collector interface formed from alternating layers of A1GaN/GaN forming a superlattice;

[an n+ doped A1GaN layer;]

an n+ doped A1GaN emitter layer formed on top of said base layer defining an emitter base interface;

a base contact formed on said base layer;

a collector contact formed on said subcollector; and

an emitter contact formed on said emitter.

3. (Amended) A heterojunction bipolar transistor (HBT) comprising:

a substrate;

an n+ doped GaN subcollector layer;

an n- doped GaN collector layer;

a p+ doped base layer formed on top of said collector layer defining a base collector interface formed from alternating layers of A1GaN/GaN forming a superlattice;

[an n+ doped A1GaN layer;]

an n+ doped AlGaN emitter layer formed on top of said base layer defining an emitter base interface, the Al concentration at said emitter base interface being greater at said emitter base interface than said base collector interface;

a base contact formed on said base layer;

a collector contact formed on said subcollector; and

an emitter contact formed on said emitter.

5. (Amended) A heterojunction bipolar transistor (HBT) comprising:

a substrate formed from a material selected from the group consisting of sapphire and silicon carbide;

an n+ doped GaN subcollector layer;

an n- doped GaN collector layer;

a p+ doped base layer formed on top of said collector layer defining a base collector interface formed from alternating layers of AlGaN/GaN forming a superlattice;

[an n+ doped AlGaN layer;]

an n+ doped AlGaN emitter layer formed on top of said base layer defining an emitter base interface;

a base contact formed on said base layer;

a collector contact formed on said subcollector; and

an emitter contact formed on said emitter.

10. (Amended) The process as recited in claim 9, wherein step (c) comprises [comprising] forming said base layer with an Al concentration at said base collector interface being less than the Al concentration at said base emitter interface.